Standards Requirements Package 9: Emergency Management to Other Centers

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Table of Contents

Figures

Tables

1 Introduction to Standards Requirements Documentation

The Standards Requirements Packages are intended to be used in conjunction with the other architecture documents. In particular, the introductory chapters of the Standards Requirements Document provide contextual material and explanations/justifications of some of the methods used to evaluate and rate architecture flows. However, it is recognized that many people may initially only receive a given Standards Requirements Package, without the associated supporting material. To aid these individuals, we offer some generic introductory material to promote understanding of the context and approach used to create a Standards Requirements Package. Ultimately, any standards development organization pursuing an ITS-related standard should ensure that they have access to a complete set of the architecture documents as a reference source.

1.1 Standards Requirements Document Executive Summary

The executive summary of the Standards Requirements Document is reproduced here, to provide a sense of the overall goals and content of the document.

The Standards Requirements Document ("SRD") collects information from the other National ITS Architecture program documents and reorganizes it in a manner intended to support the development of critical ITS standards. The key results in the SRD are a reference model for the National ITS Architecture, a rating scheme for evaluating the standardization issues associated with individual data flows that make up the architecture interfaces, and then a set of priority groupings of interfaces into standards requirements "packages". These results and the major conclusions are summarized below.

The introductory section explains the structure of the SRD and its intended usage. The strategy is that the reference model provides the overall context for a standards development organization ("SDO"). A given SDO can pull a particular package of standards requirements out of the document and then use the reference model as a quick reference to the overall architecture. More detailed needs will require going to the original source documents, such as the Logical or Physical Architectures.

The next section provides the rationale for several different ratings schemes applied to the architecture interconnects and flows. These include interoperability requirements, technology maturity assessments, stakeholder interest. All architecture interconnects were examined with respect to these measures. The stakeholder interest and interoperability requirements in particular were then used as the basis for selecting the standards requirements packages. In general, interfaces associated with mobile systems had both the greatest stakeholder interest and the most stringent interoperability requirements. Following close behind were interfaces associated with Traffic Management and Information Service Provider subsystems.

The Architecture Reference Model is provided next as a high level definition of the components that form the National ITS Architecture. It depicts the interconnectivity of the subsystems and terminators, their definitions, and suitable types of communications strategies. This reference model is an important tool for communicating the full breadth of the architecture at an abstracted level. In the SRD it is intended as a contextual reference, but, as a separate document, the reference model has received international circulation through the International Standards Organization (ISO) as a basis for documenting and comparing ITS architectures.

The "meat" of the SRD is the set of standards requirements packages. Each package is a special grouping of standards requirements and contextual information intended to be used in a nearly standalone fashion by an SDO. Thus, packages have been selected that cover the key ITS priorities, maintain the integrity and vision of the National ITS Architecture, and also are perceived as having an interested stakeholder

constituency that will help drive standardization. This is a difficult balancing act, but the following 13 packages were identified as covering the high priority standardization needs for the architecture program:

1. Dedicated Short Range Communications (DSRC, formerly "VRC")
2. Digital Map Data Exchange and Location Referencing Formats
3. Information Service Provider Wireless Interfaces
4. Inter-Center Data Exchange for Commercial Vehicle Operations
5. Personal, Transit, and HAZMAT Maydays
6. Traffic Management Subsystem to Other Centers (except EMS)
7. Traffic Management Subsystem to Roadside Devices and Emissions Monitoring
8. Signal Priority for Transit and Emergency Vehicles
9. Emergency Management Subsystem to Other Centers
10. Information Service Provider Subsystem to Other Centers (except EMS and TMS)
11. Transit Management Subsystem Interfaces
12. Highway Rail Intersections (HRI)
13. Archived Data Management Subsystem Interfaces

These 13 areas cover much of the National ITS Architecture and represent the distillation of stakeholder interests and architecture interoperability requirements. If standardization can be achieved in the near term for all or most of these packages, then ITS will be a long ways towards achieving the original vision captured in the user service requirements.

1.2 Constructing a Standards Requirements Package

The intent of creating a Standards Requirements Package is to facilitate efforts to standardize some subset of the National ITS Architecture. The "packaging" process involves abstracting and reorganizing information from other documents, primarily the Logical and Physical Architectures. We have gone through a number of iterations to try and achieve a format that is understandable and useful for SDOs; in the end, while there is not a universal consensus, we have tried to address the substance of most of the comments received.

This Standards Requirements Package has the following main components:

- General introduction to the scope and intent of this package
- Message transaction sets
- Decomposition of the interfaces
- Communications Considerations
- Constraints
- Leveled Data Item definitions

The general introduction is self-explanatory, but the other items require some explanation. We will address them one at a time:

Message Transaction Sets: In order to accomplish a given activity, a series of messages usually have to be exchanged between two or more subsystems. These messages, as a group, constitute a message transaction set. The sequencing of the messages is shown via an ISO-style message sequence chart. Typically the physical architecture flow or highest level logical architecture data flows represent individual messages.

Interface Decomposition: This is the hierarchy of items that constitute an interface. It starts with the interface between two subsystems itself, which is then decomposed into physical architecture flows. Each of the physical architecture flows is then decomposed into a set of Leveled Architecture Flows. These sets of flows have been created in order to capture the essential information described by the National ITS Architecture on each Subsystem interface of interest. The Leveled Architecture Flows can be thought of as a simplified view of the logical architecture information, removing aggregation of data which does not add value to describing the essential information on the interface, and removing some of the lower level details in the existing data flows. These leveled architecture flows are traceable to flows in the logical architecture. The physical architecture data flows are labeled with the type of communications technology appropriate for that flow. Figure 1 shows an example of an interface decomposition. The leveled data items represent a simplification of the logical architecture information to focus on the essential data on each subsystem interface. They have been developed in order to provide traceability between the ITS standards being developed and the National ITS Architecture. Once a draft standard has been developed, the question that must be addressed is whether the standard addresses completely all elements of the National ITS Architecture interface. Due to the complex hierarchical nature of the Logical Architecture data flows, comparison with standards outputs is very difficult. By creating a simplified view of each interface, it is possible to more effectively trace the standards outputs to the National ITS Architecture.

Communications Considerations provides a discussion of the basic nature of the communications modalities that are suitable for supporting the interfaces in the particular standards requirements package. This section identifies some high level requirements, but the primary focus is to provide information that is viewed as useful to the initiation of the standardization process.

Constraints lists the architecture flows and any constraints placed upon them.

Leveled Data Items: This section provides a set of definitions for each of the leveled data elements included in the Interface Decomposition section. These definitions are simplified versions of the definitions contained in the Logical Architecture Data Dictionary, providing just the essential information to define the key elements of a subsystem interface.

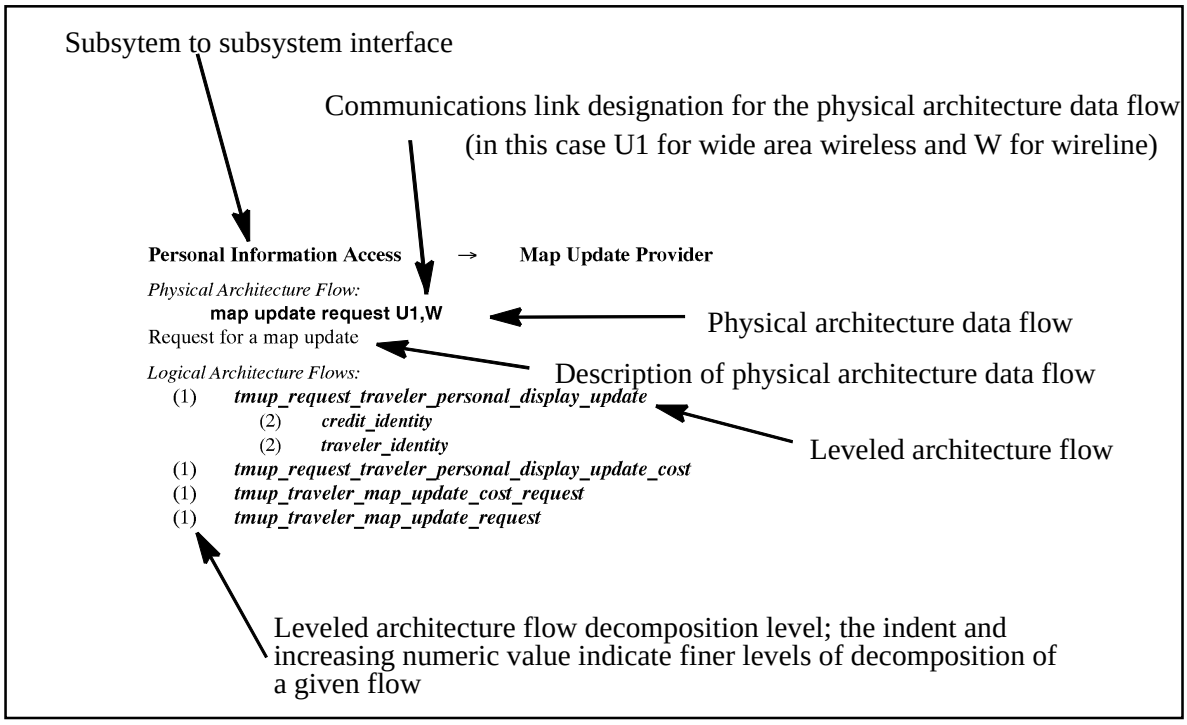

Figure 1. Example of the parts of an interface decomposition

As a final clarification, it is useful to remind readers of the distinction between the layers in the ISO OSI communications reference model and the layers in the National ITS Architecture. For purposes of analysis and discussion, the National ITS Architecture has been portrayed as having three layers: *the transportation, the communications, and the institutional layer*. The first two are of concern here. The transportation layer contains all the functionality of the National ITS Architecture. As a consequence, any discussion of interfaces, messages, data dictionary entries, etc., is drawn from the information in the transportation layer. The communications layer describes the technology required to support the information exchange needs of the transportation layer. These National ITS Architecture layers can be roughly mapped to the ISO OSI reference model; the transportation layer is typically at or above the application layer and the communications layer is most often concerned with the lowest four layers of the ISO OSI reference model. The interested reader is directed to the Communications Analysis Document for a more substantial explanation of this relationship.

This explanation of the layers is offered here because the terminology can be confusing. Every effort has been made to clarify when the "layered model" is the National ITS Architecture and when it is the OSI reference model. In general, when the term "communications layer" is used in the Standards Requirements Document, it refers to the National ITS Architecture "layer".

2 Introduction: Emergency Management Center to Other Centers

Emergency response and emergency management are recognized as key factors in both traveler safety and in congestion reduction. As MPOs design strategies for integrated incident management, an important component is invariably interagency coordination and data exchange. The national architecture envisions a high degree of cooperation between traffic management, transit, media / information providers, and emergency management. Through coordinated responses to emergencies, safety and service can be enhanced. This package collects the requirements from the architecture to support the data exchange necessary for this type of coordination.

A related package is the Signal Priority standards requirements package, which supports the preemption of signals for emergency vehicles. Neither package requires the other, but if both are standardized and deployed then the full level of coordinated emergency response envisioned in the national architecture would be realized.

The subsystems and the physical architecture data flows that are applicable to the Emergency Management Center to Other Centers standards package are shown in Figure 2.

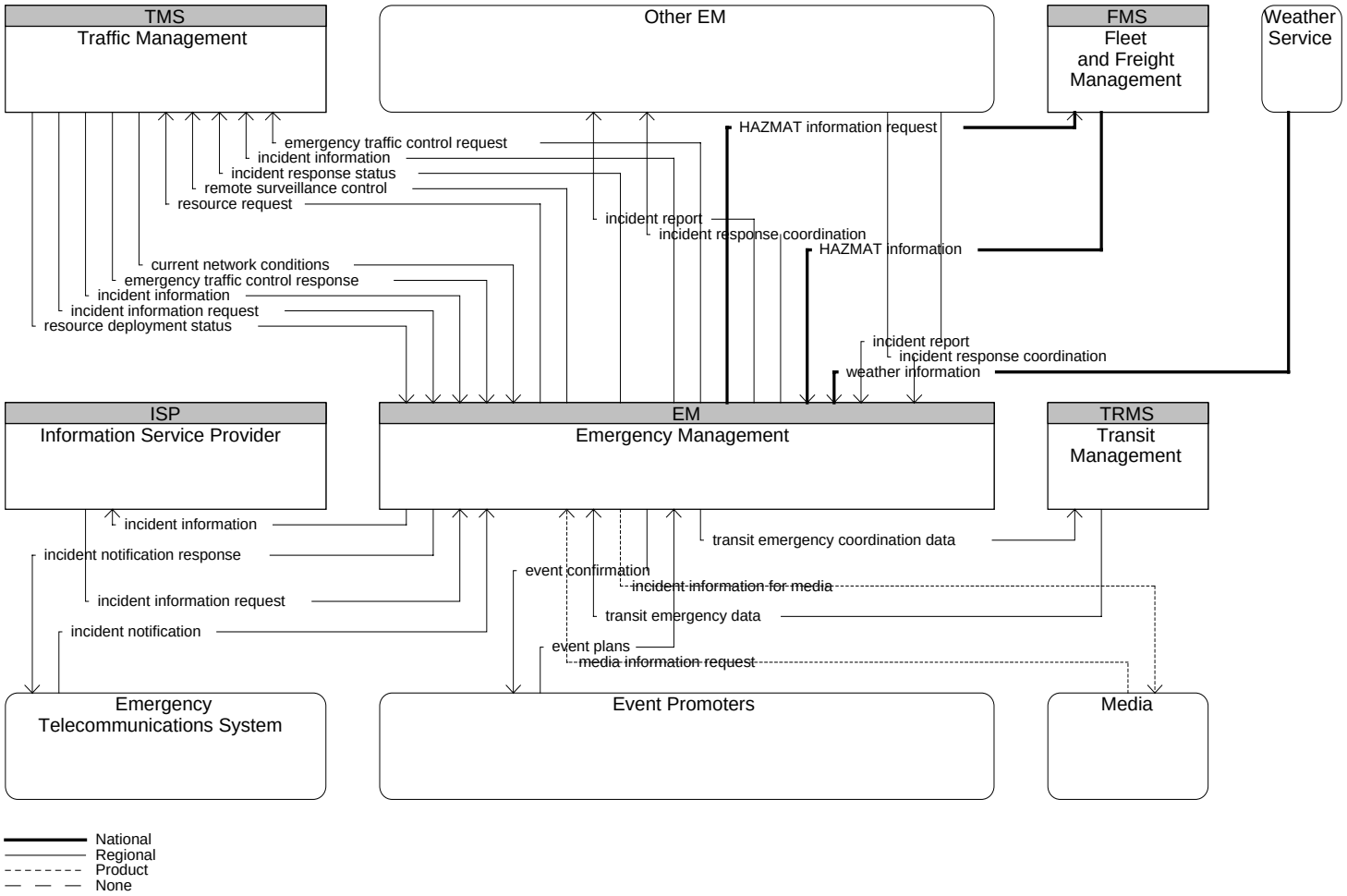

Figure 2. Interfaces for Emergency Management Subsystem to Other Centers

3 Transaction Sets for Emergency Management (EM) to Other Centers

In this section we define the transaction sets needed to accomplish different ITS tasks. A message sequence chart format along the lines of those defined under ISO standardization is used for clarity of presentation. The following subsections each discuss the interactions between the Emergency Management Subsystem (EM) and a center subsystem or terminator. The transaction set figures used in this chapter identify the messages that go between the EM and the entity in the title of the associated subsection. Where messages follow each other top to bottom, they represent a transaction sequence or protocol. Where messages are separated by a horizontal dotted line, the messages are distinct, and not related in any particular sequence. Notes to the right of the messages or in some cases groups of messages amplify on details of the message protocols and sometimes a number in a circle identifies a following numbered section in the text which also describes the particular message or message sequence function.

3.1 Emergency Telecommunications System and Other EM

The interface between EM and the Emergency Telecommunications System and Other EM Terminators (Note: Other EM is treated as a terminator in the architecture) supports Incident Management services. The message transaction sets for this service is shown in Figure 3. and Figure 4. .

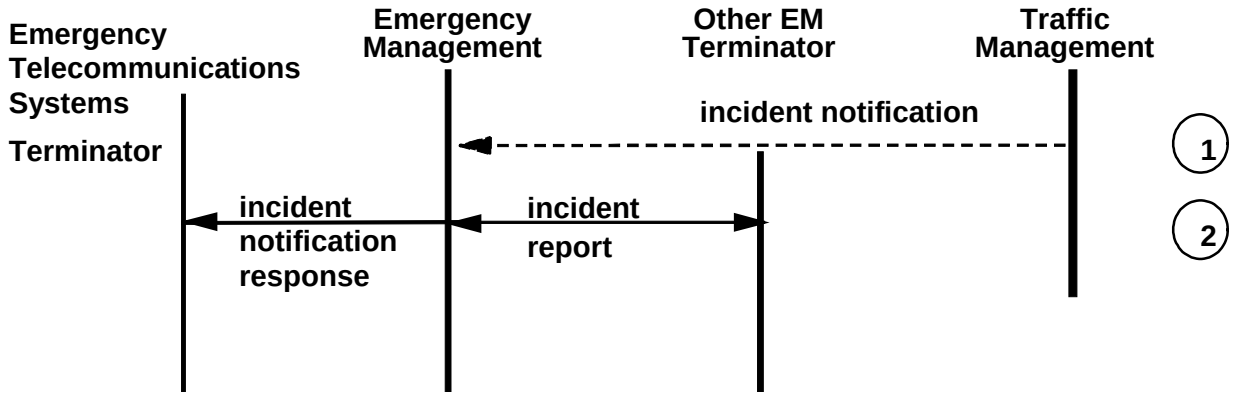

Figure 3. TMS initiated Incident Transaction Sets

1. There are several ways for the EM to be notified of an incident. One way, shown above, is for the Traffic Management Subsystem (TMS) to notify the EM. When an incident is verified by the Traffic Management Subsystem (TMS), an appropriate incident response is prepared and messages are sent to the EM subsystem to alert them to the incident.

2. On receipt of a TMS incident notification message, the EM will notify as necessary:

    a. Other EMs (e.g., separate agency interfaces for police, fire, EMS-Emergency Medical Services) via the incident report flow and

    b. The appropriate Emergency Telecommunications Systems via the emergency incident notification response flow.

The EM may also learn about an incident from either the Emergency Telecommunications System or the Other EM. Figure 4. illustrates this transaction set.

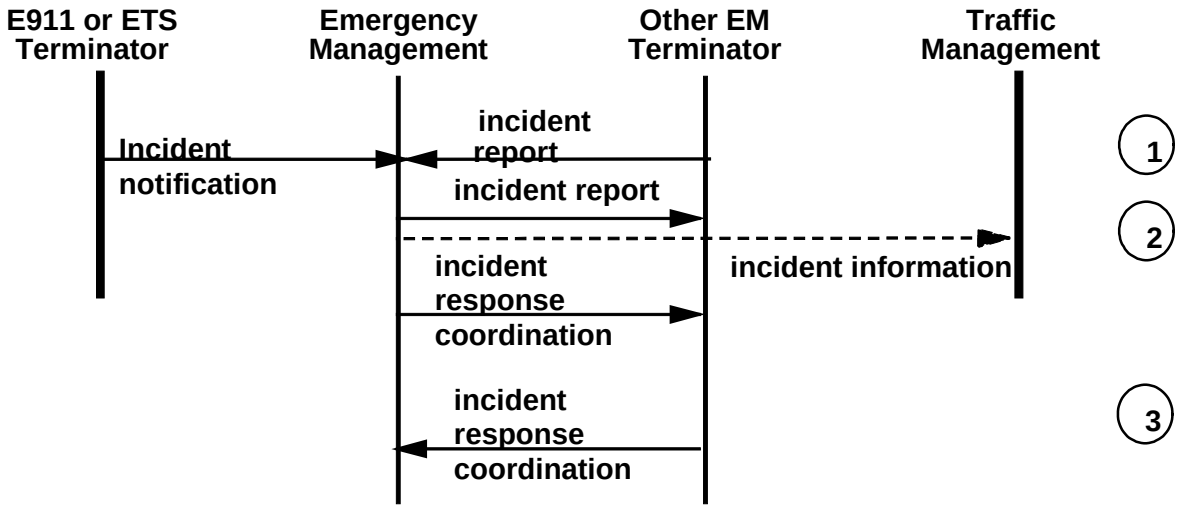

Figure 4. Emergency Telecommunications System or Other EM Initiated Incident Transaction Sets

1. The EM may receive 'incident notification' from the Emergency Telecommunications System or incident report from the Other EM.
2. This information is processed by the EM subsystem and a determination made to forward the incident alert to the TMS via the incident information message. The 'incident report' can also be forwarded to the Other EM if the information originated from Emergency Telecommunications System.
3. Another important function of the EM is to coordinate incident response with Other EM, and to receive incident response coordination information.

3.2 Fleet and Freight Management

The Emergency Management Center (EM) coordinates hazardous material (HAZMAT) incident response. The transaction set for this service between the EM and Fleet and Freight Management subsystem is shown in Figure 5.

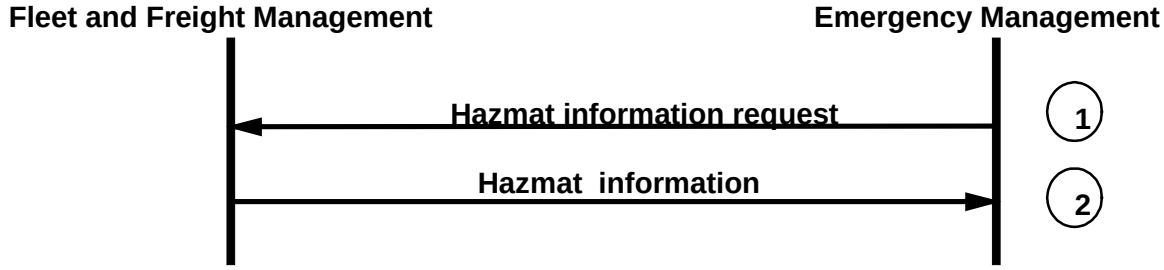

Figure 5. Fleet and Freight Management Subsystem and EM Transaction Sets

1. The EM may ask the Fleet and Freight Management Center for more information about the HAZMAT load involved in the incident (and concurrently to notify the Fleet and Freight Management Center about the incident).
2. The Fleet and Freight Management center is responsible for supplying HAZMAT load information to the EM on request.

3.3 Information Service Provider

The EM interfaces with the Information Service Provider (ISP) to provide incident information to the ISP. The transaction set for this interaction is shown in Figure 6.

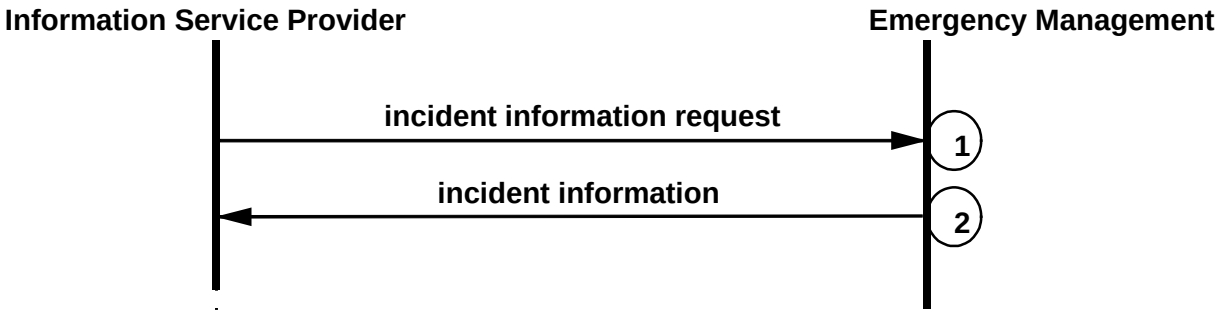

Figure 6. Information Service Provider Subsystem and EM Transaction Set

1. The ISP requests incident information from the EM subsystem specifying the type(s) of incidents of interest and how far back in time the EM should search to provide incident information. The time range is useful to avoid subsequent transmission of incident information that was sent in response to a prior request.

2. This message is sent for each incident known to the EM in response to the incident information request message. This message includes incident location, start time, expected duration, type of incident, severity and traffic impact.

3.4 Traffic Management

The Traffic Management to EM transaction sets are shown in Figure 7. In support of the TMS's overall goal of controlling traffic, the TMS obtains incident information from the EM in a request/ response mode. As a separate function the EM can submit emergency vehicle traffic control requests (for special signal priority) directly to the TMS.

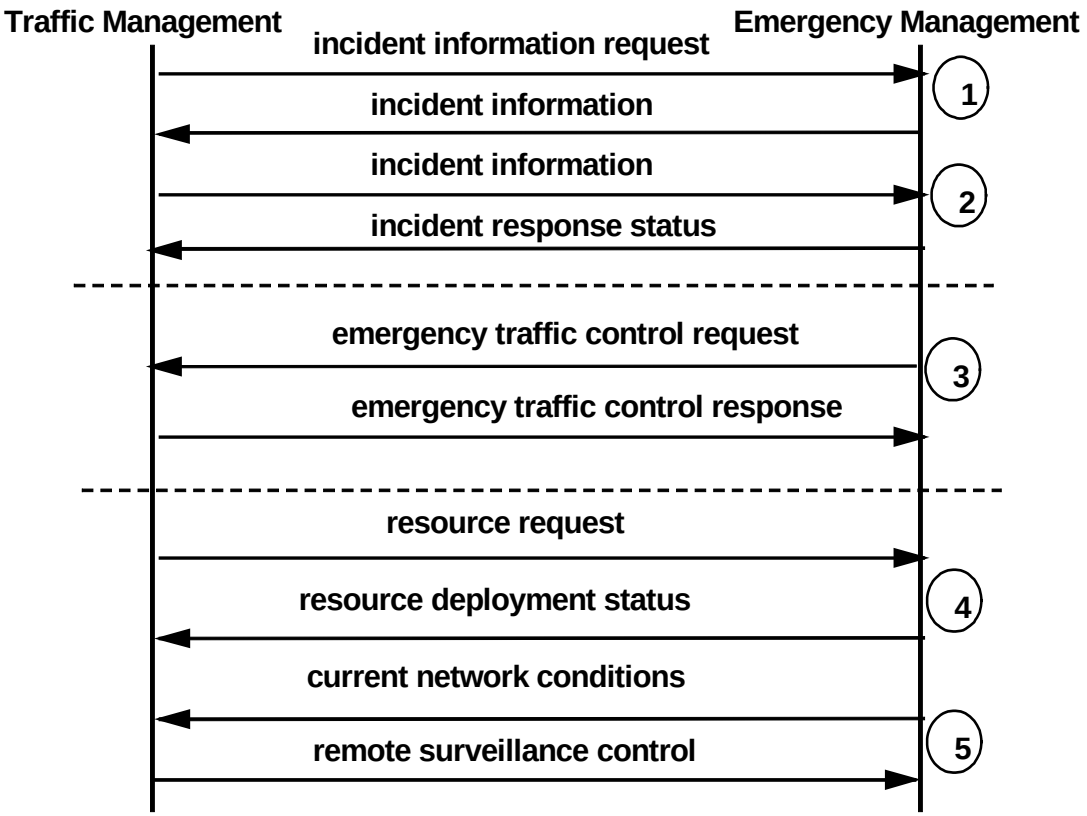

Figure 7. Traffic Management Subsystem and EM Transaction Sets

1. The TMS requests incident information from the EM subsystem specifying the type(s) of incidents of interest and how far back in time the EM should search to provide incident information. The time range is useful to avoid subsequent transmission of incident information that was sent in response to a prior request.

2. This message is sent for each incident known to the EM in response to the incident information request message. This message includes incident location, start time, expected duration, type of incident and severity. The EM also sends information regarding the status of incident response actions that it is managing. Additionally, the TMS can notify the EM of the existence of incidents, including incident location, start time, expected duration, type of incident, and severity.

3. The emergency traffic control request message identifies each segment of a route that an emergency vehicle is expected to follow. The start time of the emergency vehicle route is identified, as well as the estimated arrival time at each segment. If the vehicle is enroute then the timestamped location of the vehicle is also provided. The TMS will respond with an emergency traffic control response message to keep the EM aware of the actions it has taken to provide priority or other forms of special routing for the emergency vehicle.

4. The EM can also request resources from the TMS (e.g. road or lane closures, lane sign changes, or even physical resources such as cones), and the TMS will respond with the status of the request.

5. The EM will receive current network conditions to provide it a real-time view of traffic conditions. Finally the EM may have the capability to control surveillance cameras directly through the remote surveillance control message.

3.5 Transit Management

The Transit Management Subsystem (TRMS) interfaces with the EM for an emergency transaction set as shown in Figure 8. Once the TRMS has determined that there is an emergency requiring EM attention, it notifies the EM subsystem to coordinate a response.

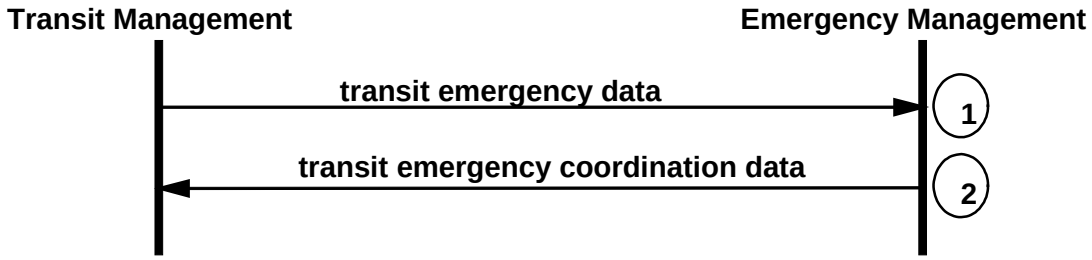

Figure 8. Transit Management Subsystem and EM Transaction Set

6. The TRMS sends a transit emergency data message to the EM to alert the EM of a security incident and to coordinate other emergency service responses and / or notify Emergency Telecommunications.

7. The EM will determine the appropriate response and send a transit emergency coordination response message to the TRMS indicating the actions taken or to be taken.

3.6 Media

The EM will interface with the Media terminator to provide incident information which has been summarized for external release. The transaction set for this interface is shown in Figure 9. The interface can operate on a pull basis (request/ response) or on a push basis (EM sending information to the Media without a specific request.

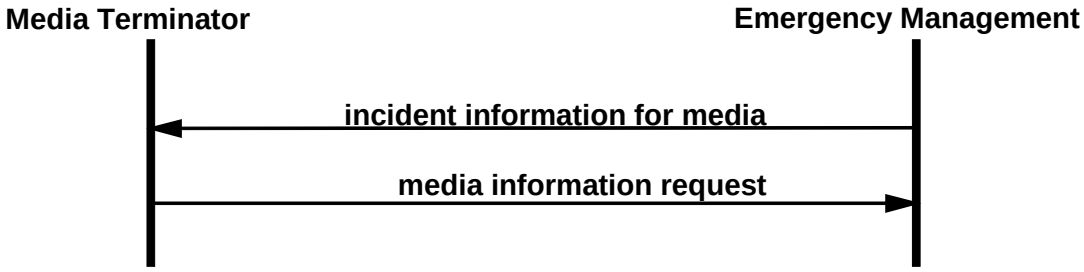

Figure 9. Media Terminator and EM Transaction Set

3.7 Weather Service

The EM can access weather information (either current or predicted) from the Weather Service Terminator as shown in Figure 10.

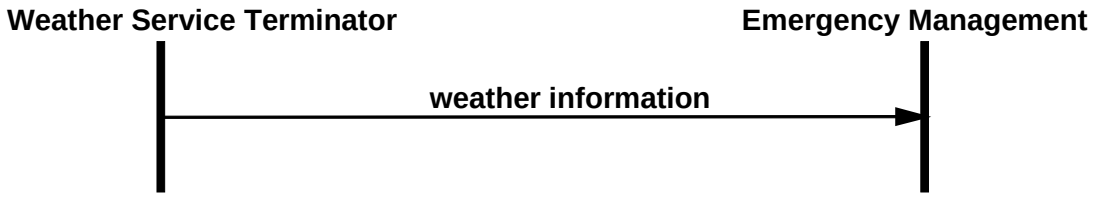

Figure 10. Weather Service Terminator and EM Transaction Set

3.8 Event Promoters

Event Promoters provide event information such as date, time, estimated duration, location, and any other pertinent information to traffic movement at the occurrence of a special event such as sporting events, conventions, motorcades/parades, and public/political events.

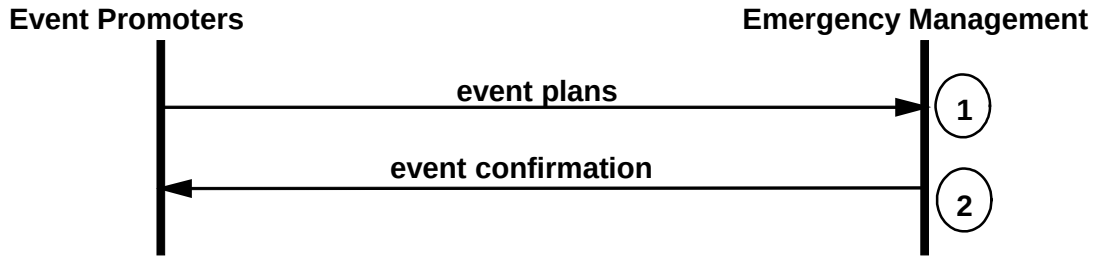

Figure 11. Event Promoters

4 Interface Decomposition

This section shows the interface decomposition for the interfaces covered in this package. The format shows the interface followed by the first physical architecture data flow in the interface and its description. Each of the physical architecture flows is then decomposed into its constituent leveled data items, which in turn are decomposed hierarchically into more basic leveled architecture flows. The leveled data items are numbered and indented to indicate which are top level flows (1) and which are constituent data flows (numbered 2 and lower). The description of the top level leveled data item is given. The full leveled data item definition for the top level flows and for all the constituent flows is given in Section 7. That section contains the leveled data item entries, listed in alphabetical order, for all of the leveled data items contained in this package. The leveled data items represent a simplification of the logical architecture information to focus on the essential data on each subsystem interface. They are traceable to the original logical architecture data elements, and have been developed in order to provide traceability between the ITS standards being developed and the National ITS Architecture. Once a draft standard has been developed the question that must be addressed is whether the standard completely addresses all elements of the National ITS Architecture interface. Due to the complex hierarchical nature of the Logical Architecture data flows, comparison with standards outputs is very difficult. By creating a simplified view of each interface, it is possible to more effectively trace the standards outputs to the National ITS Architecture.

4.1 Emergency Telecommunications System->Emergency Management

Physical Architecture Flow: incident notification W
The notification of an incident including its nature, severity, and location.

Leveled Data Items:
(1) ***caller_information***
This data item contains information about the caller including a call-back number and the caller location (as a street address, latitude/ longitude, or other reference) when available.

(1) ***incident_description***
This data item contains the description and other free form information associated with an incident.

(1) ***incident_location***
This data item contains the location at which an incident will take place (for planned events) or is taking place (for current incidents).

(1) ***incident_severity***
This data item identifies the severity of an incident.

(1) ***incident_type***
This data item uniquely defines the type of incident.

4.2 Event Promoters->Emergency Management

Physical Architecture Flow: event plans W
Plans for major events possibly impacting traffic.

Leveled Data Items:
(1) ***from_ep_planned_event_data***
This data item carries data about planned events in order to coordinate with the emergency service providers and process information about planned activities in preparation for an incident.

4.3 Fleet and Freight Management->Emergency Management

Physical Architecture Flow: Hazmat information W
Information about a particular hazmat load including nature of the load and unloading instructions. May also include HAZMAT vehicle route and route update information

Leveled Data Items:
(1) ***commercial_hazmat_route_information***
This data item contains information about the route about to be used or planned for a commercial vehicle that will carry hazardous materials. This information may cause the Emergency Services to raise an incident for all or part of the vehicle's route.

(2) ***commercial_route_number***

(2) ***route_cost***

(2) ***route_list***

(2) ***route_segment_description***

(2) ***route_segment_end_point***

(2) ***route_segment_estimated_arrival_time***

(2) ***route_segment_estimated_condition***

(2) ***route_segment_estimated_travel_time***

(2) ***route_segment_identity***

(2) ***route_segment_mode***

(2) ***route_segment_predicted_weather***

(2) ***route_segment_start_point***

(2) ***route_start_time_date***

(2) ***route_statistics***

(1) ***commercial_hazmat_vehicle_information***
This data item contains information about hazardous materials that are on-board the vehicle and details of the vehicle itself.

(2) ***hazmat_load_data***

(2) ***hazmat_vehicle_data***

4.4 Information Service Provider->Emergency Management

Physical Architecture Flow: incident information request W
Request for incident information, clearing time, severity. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

Leveled Data Items:

(1) ***incident_earliest_reporting_time***
This data item is part of incident information request, the earliest time for which incident reports are requested.

(1) ***incident_type***
This data item uniquely defines the type of incident.

4.5 Media->Emergency Management

Physical Architecture Flow: media information request W
Request from the media for current transportation information.

Leveled Data Items:
(1) ***emergency_information_request***
This data item contains a request for data on emergencies to be sent to the Media. The request must specify the type and severity of emergency desired to be reported on, and the geographic area(s) to which it should relate.

4.6 Other EM->Emergency Management

Physical Architecture Flow: incident report W
Report of an identified incident including incident location, type, severity and other information necessary to initiate an appropriate incident response.

Leveled Data Items:
(1) ***emergency_center_identity***
This data item identifies the emergency center that is either sending or receiving data about incidents.

(1) ***from_other_ec_mayday_emergency_data***
This data item contains information about an emergency that was reported by a Mayday system, verified by the Mayday service provider, and determined to require a response from a public safety agency or another authorized responder.

(2) ***call_back_information***

(2) ***date***

(2) ***driver_information***

(2) ***location_identity***

(2) ***mayday_agency_ID***

(2) ***processed_cargo_data***

(2) ***time***

(2) ***vehicle_crash_sensor_data***

(2) ***vehicle_identity***

(2) ***vehicle_security_status***

(2) ***vehicle_system_status***

(1) ***incident_description***
This data item contains the description and other free form information associated with an incident.

(1) ***incident_duration***
This data item contains the expected duration of an incident from its start time until the time at which it is expected that it will have no further effect on traffic conditions.

(1) ***incident_location***
This data item contains the location at which an incident will take place (for planned events) or is taking place (for current incidents).

(1) ***incident_number***
This data item identifies a specific incident.

(1) ***incident_severity***
This data item identifies the severity of an incident.

(1) ***incident_start_time***
This data item contains the incident start time.

(1) ***incident_type***
This data item uniquely defines the type of incident.

Physical Architecture Flow: incident response coordination W
Incident response procedures, resource coordination, and current incident response status that are shared between allied response agencies to support a coordinated response to incidents. This flow also coordinates a positive hand off of responsibility for all or part of an incident response between agencies.

Leveled Data Items:
(1) ***agency_incident_response_procedures***
This data item coordinates standard response procedures between public safety agencies (e.g. police, fire and rescue, EMS, and towing) and other allied agencies that participate in an incident response.

(1) ***hand_off_coordination***
This data item coordinates a positive hand off of responsibility for all or part of an incident response between agencies. It identifies both agencies, the incident, the portion of the response to be handed off, and other information. Many types of transactions will support the negotiation and transfer of responsibility indicated by this data item. The requirement is that the transaction be positive and unambiguous so that both parties can positively determine that a transfer of responsibility has occurred.

(1) ***incident_resource_coordination***
This data item coordinates the request and deployment of resources from multiple agencies to the incident scene.

(1) ***incident_response_status***
This data item provides the current status of an incident response indicating site management strategies in effect, incident clearance status, the incident command structure that is in place, and points of contact.

(1) ***staging_area***
This data item identifies and locates staging areas in order to coordinate responses to major incidents.

4.7 Traffic Management->Emergency Management

Physical Architecture Flow: current network conditions W
Current traffic information, road conditions, and camera images that can be used to locate and verify reported incidents, and plan and implement an appropriate response.

Leveled Data Items:
(1) ***incident_video_image***
This data item contains a high resolution digitized image of a potential or current incident at a particular point on the road or freeway network

(1) ***link_state_data***
This data item contains data about traffic conditions on each link within the road (surface street) and highway network in the geographic area served by the TMC.

(2) ***link_list***

(2) ***vehicle_count***

(2) ***vehicle_headway***

(2) ***vehicle_occupancy***

(2) ***vehicle_queue_length***

(2) ***vehicle_speed***

(1) ***roadway_environment_conditions***
This data item contains processed environment sensor information which provides a summary of environment conditions referenced to a link.

(2) ***link_environment_conditions***

(2) ***link_list_identities***

Physical Architecture Flow: emergency traffic control response W
Status of the special traffic signal control strategy implemented in response to the emergency traffic control request.

Leveled Data Items:
(1) ***date***
This data item specifies a calendar date that is normally used to indicate currency or effectivity of other data.

(1) ***route_segment_estimated_arrival_time***
This data item contains the estimated time at which the route segment end point will be reached.

(1) ***route_segment_identity***
This data item identifies a route segment by name, location, or other standard location reference.

(1) ***selected_emergency_vehicle_strategy***
This data item contains the strategy which has been selected to enable priority to be given to emergency vehicles through the road (surface street) and highway network controlled by the TMC.

(2) ***indicator_identity_list***

(2) ***ramp_identity_list***

(2) ***selected_emergency_strategy***

(1) ***time***
This data item contains the current time of day and will be associated with other data items and (possibly) a date.

Physical Architecture Flow: incident information W
Notification of existence of incident and expected severity, location, time and nature of incident.

Leveled Data Items:
(1) ***incident_duration***
This data item contains the expected duration of an incident from its start time until the time at which it is expected that it will have no further effect on traffic conditions.

(1) ***incident_location***
This data item contains the location at which an incident will take place (for planned events) or is taking place (for current incidents).

(1) ***incident_response_clear***
This data item is an indication that the incident has been cleared from the roadway.

(1) ***incident_severity***
This data item identifies the severity of an incident.

(1) ***incident_start_time***
This data item contains the incident start time.

(1) ***incident_traffic_impact***
This data item contains details of the impact that a particular incident will have on traffic flows.

(1) ***incident_type***
This data item uniquely defines the type of incident.

(1) ***wrong_way_vehicle_detection***
This data item contains data about wrong-way vehicles detected in reversible lanes.

(2) ***incident_video_image***

(2) ***vehicle_license***

Physical Architecture Flow: incident information request W
Request for incident information, clearing time, severity. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

Leveled Data Items:
(1) ***incident_details_request***
This data item is used to request details of incidents from Emergency Services

Physical Architecture Flow: resource deployment status W
Status of traffic management center resource deployment identifying the resources available and their current deployment status.

Leveled Data Items:
(1) ***resource_deployment_status***
This data item is sent to the Manage Traffic function indicating the availability of the requested traffic management resources and provides current status of their deployment.

4.8 Transit Management->Emergency Management

Physical Architecture Flow: transit emergency data W
Initial notification of transit emergency at a transit stop or on transit vehicles and further coordination as additional details become available and the response is coordinated.

Leveled Data Items:
(1) ***incident_duration***
This data item contains the expected duration of an incident from its start time until the time at which it is expected that it will have no further effect on traffic conditions.

(1) ***incident_location***
This data item contains the location at which an incident will take place (for planned events) or is taking place (for current incidents).

(1) ***incident_severity***
This data item identifies the severity of an incident.

(1) ***incident_start_time***
This data item contains the incident start time.

(1) ***transit_coordination_information***
This data item contains incident response coordination information for use by processes in that function.

(1) ***transit_emergency_data***
This data item contains details of an emergency on-board a transit vehicle.

(2) ***incident_duration***

(2) ***incident_location***

(2) ***incident_severity***

(2) ***incident_start_time***

(1) ***transit_incident_details***
This data item contains details of an incident in the transit operations network.

(2) ***incident_duration***

(2) ***incident_location***

(2) ***incident_severity***

(2) ***incident_start_time***

(1) ***transit_response_to_incident***
This data item contains details of what transit action is required in response to an incident. It is used by processes within that function.

4.9 Weather Service->Emergency Management

Physical Architecture Flow: weather information W
Accumulated forecasted and current weather data (e.g., temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.).

Leveled Data Items:
(1) ***current_weather_from_weather_service***
This data item contains details of the current weather conditions, e.g. temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.

(1) ***predicted_weather_from_weather_service***
This data item contains details of the predicted weather conditions, e.g. temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.

4.10 Emergency Management->Emergency Telecommunications System

Physical Architecture Flow: incident notification response W
Interactive acknowledgment and verification of the incident information received, requests for additional information, and general information on incident response status.

Leveled Data Items:
(1) ***incident_acknowledge***
This data item acknowledges the receipt of incident information, requests additional information, and provides general information on response status.

4.11 Emergency Management->Event Promoters

Physical Architecture Flow: event confirmation W
Confirmation that special event details have been received and processed.

Leveled Data Items:
(1) ***to_ep_planned_event_confirmation***
This data item is the confirmation that the previously submitted event data has been accepted.

4.12 Emergency Management->Fleet and Freight Management

Physical Architecture Flow: Hazmat information request W
Request for information about a particular hazmat load.

Leveled Data Items:
(1) ***hazmat_request***
This data item contains a request for information about hazardous materials that are being or about to be carried by commercial vehicles.

4.13 Emergency Management->Information Service Provider

Physical Architecture Flow: incident information W

Notification of existence of incident and expected severity, location, time and nature of incident.

Leveled Data Items:
(1) ***incident_duration***
This data item contains the expected duration of an incident from its start time until the time at which it is expected that it will have no further effect on traffic conditions.

(1) ***incident_location***
This data item contains the location at which an incident will take place (for planned events) or is taking place (for current incidents).

(1) ***incident_number***
This data item identifies a specific incident.

(1) ***incident_severity***
This data item identifies the severity of an incident.

(1) ***incident_start_time***
This data item contains the incident start time.

(1) ***incident_traffic_impact***
This data item contains details of the impact that a particular incident will have on traffic flows.

(1) ***incident_type***
This data item uniquely defines the type of incident.

4.14 Emergency Management->Media

Physical Architecture Flow: incident information for media W
Report of current desensitized incident information prepared for public dissemination through the media.

Leveled Data Items:
(1) ***incident_duration***
This data item contains the expected duration of an incident from its start time until the time at which it is expected that it will have no further effect on traffic conditions.

(1) ***incident_location***
This data item contains the location at which an incident will take place (for planned events) or is taking place (for current incidents).

(1) ***incident_number***
This data item identifies a specific incident.

(1) ***incident_severity***
This data item identifies the severity of an incident.

(1) ***incident_start_time***
This data item contains the incident start time.

(1) ***incident_type***
This data item uniquely defines the type of incident.

4.15 Emergency Management->Other EM

Physical Architecture Flow: incident report W
Report of an identified incident including incident location, type, severity and other information necessary to initiate an appropriate incident response.

Leveled Data Items:
(1) ***emergency_center_identity***
This data item identifies the emergency center that is either sending or receiving data about incidents.

(1) ***incident_description***
This data item contains the description and other free form information associated with an incident.

(1) ***incident_duration***
This data item contains the expected duration of an incident from its start time until the time at which it is expected that it will have no further effect on traffic conditions.

(1) ***incident_location***
This data item contains the location at which an incident will take place (for planned events) or is taking place (for current incidents).

(1) ***incident_number***
This data item identifies a specific incident.

(1) ***incident_severity***
This data item identifies the severity of an incident.

(1) ***incident_start_time***
This data item contains the incident start time.

(1) ***incident_type***
This data item uniquely defines the type of incident.

(1) ***to_other_ec_mayday_emergency_data***
This data item contains information about an emergency that was reported by a Mayday system, verified by the Mayday service provider, and determined to require a response from a public safety agency or another authorized responder.

(2) ***call_back_information***

(2) ***date***

(2) ***driver_information***

(2) ***location_identity***

(2) ***mayday_agency_ID***

(2) ***processed_cargo_data***

(2) ***time***

(2) ***vehicle_crash_sensor_data***

(2) ***vehicle_identity***

(2) ***vehicle_security_status***

(2) ***vehicle_system_status***

Physical Architecture Flow: incident response coordination W
Incident response procedures, resource coordination, and current incident response status that are shared between allied response agencies to support a coordinated response to incidents. This flow also coordinates a positive hand off of responsibility for all or part of an incident response between agencies.

Leveled Data Items:
(1) ***agency_incident_response_procedures***
This data item coordinates standard response procedures between public safety agencies (e.g. police, fire and rescue, EMS, and towing) and other allied agencies that participate in an incident response.

(1) ***hand_off_coordination***
This data item coordinates a positive hand off of responsibility for all or part of an incident response between agencies. It identifies both agencies, the incident, the portion of the response to be handed off, and other information. Many types of transactions will support the negotiation and transfer of responsibility indicated by this data item. The requirement is that the transaction be positive and unambiguous so that both parties can positively determine that a transfer of responsibility has occurred.

(1) ***incident_resource_coordination***
This data item coordinates the request and deployment of resources from multiple agencies to the incident scene.

(1) ***incident_response_status***
This data item provides the current status of an incident response indicating site management strategies in effect, incident clearance status, the incident command structure that is in place, and points of contact.

(1) ***staging_area***
This data item identifies and locates staging areas in order to coordinate responses to major incidents.

4.16 Emergency Management->Traffic Management

Physical Architecture Flow: emergency traffic control request W
Special request to preempt the current traffic control strategy in effect at one or more signalized intersections or highway segments. For example, this flow can request all signals to red-flash, request a progression of traffic control preemptions along an emergency vehicle route, or request another special traffic control plan.

Leveled Data Items:
(1) ***emergency_traffic_control_request_list***
This data item contains a list of the route segments that have been provided for use by an emergency vehicle, together with the arrival time at each segment. The data will be used to generate changes to the current traffic management strategy to give the emergency vehicle priority.

(2) ***date***

(2) ***route_segment_estimated_arrival_time***

(2) ***route_segment_identity***

(2) ***time***

Physical Architecture Flow: incident information W
Notification of existence of incident and expected severity, location, time and nature of incident.

Leveled Data Items:
(1) ***incident_duration***
This data item contains the expected duration of an incident from its start time until the time at which it is expected that it will have no further effect on traffic conditions.

(1) ***incident_location***
This data item contains the location at which an incident will take place (for planned events) or is taking place (for current incidents).

(1) ***incident_number***
This data item identifies a specific incident.

(1) ***incident_severity***
This data item identifies the severity of an incident.

(1) ***incident_start_time***
This data item contains the incident start time.

(1) ***incident_type***
This data item uniquely defines the type of incident.

(1) ***incident_vehicles_involved***
This data item defines the number of vehicles involved in an incident at the time of the report.

Physical Architecture Flow: incident response status W
Status of the current incident response including traffic management strategies implemented at the site (e.g., closures, diversions, traffic signal control overrides).

Leveled Data Items:
(1) ***incident_response_status***
This data item provides the current status of an incident response indicating site management strategies in effect, incident clearance status, the incident command structure that is in place, and points of contact.

Physical Architecture Flow: remote surveillance control W
The control commands used to remotely operate another center's sensors or surveillance equipment so that roadside surveillance assets can be shared by more than one agency.

Leveled Data Items:
(1) ***remote_video_image_control***
This data item provides the necessary commands to remotely control closed circuit television cameras or other surveillance technologies that allow remote monitoring of roadway incidents.

Physical Architecture Flow: resource request W
A request for traffic management resources to implement special traffic control measures, assist in clean up, verify an incident, etc.

Leveled Data Items:
(1) ***traffic_resource_request***
This data item is used to request resources to include temporary signs, cones, and other assets that can be used to divert traffic, create detours, and otherwise manage traffic at the incident scene. It also includes requests for any other assets that may be needed to support incident clearance.

4.17 Emergency Management->Transit Management

Physical Architecture Flow: transit emergency coordination data W
Data exchanged between centers dealing with a transit-related incident.

Leveled Data Items:
(1) ***transit_coordination_information***
This data item contains incident response coordination information for use by processes in that function.

(1) ***transit_fleet_operation_request***
This data item contains a request for the transit system operator to take specified actions in response to an incident.

(1) ***transit_response_to_incident***
This data item contains details of what transit action is required in response to an incident. It is used by processes within that function.

5 Communications Layer Requirements

This chapter describes relevant requirements on the Communications Layer for the portion of the ITS National Architecture covered by this package. In general the Communications Layer supports the four lower layers of the OSI model (transport, network, data link and physical layer). A complete description of the Communications Layer is contained in the ITS National Architecture Communications Analysis Document. In addition to actual requirements the section contains some informational notes which are included in brackets.

5.1 Communications Services: Wireline and Wireless

The communication services define the exchange of information between two points and are independent of media and application (i.e., ITS user service). In essence, they are a specified set of user-information transfer capabilities provided by the communication layer to a user in the transportation layer.

Communication services consist of two broad categories, *interactive* and *distribution*. Interactive services allow the user to exchange data with other users or providers in real or near real time, asking for service or information and receiving it in the time it takes to communicate or look up the information. Distribution services allow the user to send the same message to multiple other users.

Interactive services may be either ***conversational*** or ***messaging***. Conversational implies the use of a two-way connection established before information exchange begins and terminated when the exchange is completed. Messaging, on the other hand, works more like electronic mail being exchanged between users. The messages are exchanged without establishing a dedicated path between the two sites. Each message is addressed and placed on the network for transmission, intermixed with messages from other users. The communications community labels this mode of communication a “datagram” service.

Distribution services may be either ***broadcast*** or ***multicast*** and may be used over wireline and/or wireless communication links. Broadcast messages are those sent to all users while multicast messages are sent only to a subset of users. Multicast differs from broadcast in its use of a designated address for all users and user groups. Examples of broadcast information might include current weather or road conditions, whereas multicast information might be information sent to all drivers working for a specific company. A changing group membership could be the set of users traveling between two locations or with a certain destination, for which unique information must be transmitted. The services that can be supported using circuit or packet connection mode include voice, video, image and data. (see Appendix A-1 of the communication document for a complete description.)

An additional class of communications services is location services. These fall in two categories: (1) the services that do not use the communication network (i.e., GPS, and stand alone terrestrial systems); (2) location services that use the network for providing the service (e.g., cellular based systems). In the latter case, the location services fall under the interactive services. The service will be rendered by a service provider in response to a request for information or help.

The class of communications service for each Architecture Flow in this standards package is defined in a table in the following section.

5.2 Wireline Communication Elements (w)

The interfaces of this standards package are entirely wireline interfaces. The primary requirements on the wireline communications layers are that open standards be utilized for the communications protocols. The following paragraphs provide a discussion of wireline considerations for ITS.

The wireline links represent wide area network communications elements, which can take a number of forms. Typically it will be a data network of some kind. Physically the network can be fiber, coaxial, twisted pair, or even microwave. It can be an ITS dedicated network, such as a communication system installed by a public agency to pass messages between a Traffic Management subsystem and associated Roadway subsystems distributed across a region. Alternatively it can be a privately deployed network owned and operated by a communication service provider, where operators of ITS subsystems pay a service fee for connection to and use of the network for ITS functions. More than one network used for ITS may coexist in a region, and these networks will be connected (or internetworked) to support ITS message communication between subsystems that are attached to different networks.

It is expected that the current trend toward ubiquitous internetworking of public and private data networks, as currently embodied in for example the ‘‘Internet”, will continue. This will enable inter-subsystem messaging across local, regional and national distances. What the Internet is rapidly evolving to (as security and reliability issues of today’s Internet are addressed) has been referred to as the ‘‘National Information Infrastructure”or ‘‘NII”.

In the near term, we expect that many communication elements will be dedicated, as they primarily are today. As commercial data networks are deployed, interconnected, and mature, and the cost of access and use of these private data networks drops, we expect more and more wireline networks for ITS to be supplied from Communication Service Providers (CSPs). The time when the transition from private data networks to commercial data networks becomes practical and economical will vary by region. We expect this transition to be analogous to the transition that was made early in this century from private phone networks to the Public Switched Telephone Network (PSTN). Our expectation is that in the 20-year timeframe most ITS communication will be provided by CSPs.

For the links to the TMS the evolving ITS standard is the National Transportation Communications for ITS Protocol (NTCIP). This standard is being developed for the transmission of data and messages between ITS elements. The NTCIP constitutes a set of standards define common methods of physically interconnecting ITS control equipment, establishes the protocol and procedures for establishing communications between the components and, defines procedures to develop and register common sets of manageable objects related to controlling and managing the components. The standards are being developed by National Electrical Manufacturers Association (NEMA) with support from the US DOT. NTCIP contains a suite of communications protocols, divided into several class profiles, for integrating the various components that may be included in an ITS. The standard defines the elements that allow manufacturer inter-changeability of transportation control equipment. Also, a complete end-to-end data handling procedure is defined allowing devices to perform tasks associated with communications between traffic management centers and other field equipment. The initial version of the NTCIP is being developed to support the interface from the TMS to traffic controllers and VMS signs. Work is underway to extend this to other roadside equipment. Plans are also in place to extend the protocol for center to center communications. In the area of center to center communications there are several existing and developing communications standards to choose from for the physical (and data link) layers. These include ATM, Frame Relay, MAN (IEEE 803.6), and FDDI. At the network layers TCP/IP is a widespread standardized protocol (and is being used in the NTCIP efforts). The key is that by using

standard communication protocol suites the regional integration of the wireline data will most readily be accomplished.

5.3 Wireless Communication Elements (u1 and u2)

There are no wireless interfaces in this standards requirements package.

6 Constraints

This chapter identifies constraints placed upon Physical Architecture flows.

6.1 Assessment Categories

The following categories have been used in rating the constraints that exist on the physical data flows.

1. Performance

    a. Emergency Priority (E)
    Essentially ”real-time” requirements. Emergency data that is time critical must be received by a certain absolute time, or it is useless. For these flows the communication channel may require priority in emergencies. The data channels require must be operational even when there is an emergency which might place other loads on the interface. A private communication channel or frequency may be required to satisfy the requirement.

    b. Reliability(R)
    This category encompasses both the concepts of reliability and availability. Data must be delivered reliably. Loss can not be tolerated. The communications link must also have high availability. Failure of the communication medium may result in severe accident. This communication channel may require redundant paths or extra attention paid to potential failure modes. For wireline cases, this may indicate alternate phone or other connections are required. For wireless cases (e.g. for AHS applications), special attention will be paid to the transmitters, receivers, and potential interference for these connections.

    c.Timing (T) The timing constraints are critical. If communication does not occur within set limits system failures can occur. Timing for most ITS communication services is based on the response to a request for data. Because of this, common communication media designed to handle voice data will likely support these requirements. The beacon interface has special requirements of identifying the vehicle as well as exchanging information before the vehicle gets out of range. This is more of a problem with vehicles traveling at speed. The architecture constrains such time critical access to data such that the data is available at the beacon site. This obviates the need for explicit specification of other timing information to support data transfer over a short range beacon.

    This timing constraint is related to (but not the same as) another attribute often discussed in specifying systems: latency. Latency is used to quantify end-to-end processing and transmission time (round trip delays). Data with a latency requirement must be handled within a certain time interval. This differs from ”time criticality” in that it is a relative rather than absolute time requirement (i.e. latency: interface screen must update every 2 seconds; time criticality: route instructions must be received 30 seconds prior to first turning action). Because latency requirements are greatly affected by the implementation of the subsystem elements, it can not be specified directly when discussing only the interface between two subsystems.

2. Data Sensitivity

    a. Security (S)
    Access to the data must be restricted. Data itself must be secure during transmission. This is typically used for financial information.

b. Privacy (P)
Anonymity of the data source or recipient must be protected. This is typically used for personal information.

6.2 Architecture Flow Constraints

Table 1. Architecture Flow Constraints

Source	Destination	Architecture Flow	Interconnects	Communication Service	Special Constraints
Emergency Management	Other EM	incident report	W	Conversational data, Messaging data	E
Emergency Management	Other EM	incident response coordination	W	Conversational data, Messaging data	E
Other EM	Emergency Management	incident report	W	Conversational data, Messaging data	E
Other EM	Emergency Management	incident response coordination	W	Conversational data, Messaging data	E
Traffic Management	Emergency Management	incident information	W	Messaging data	E
Traffic Management	Emergency Management	incident information request	W	Messaging data	E

7 Leveled Data Items

This section contains the leveled data item (LDI) definitions for all the leveled data item elements listed in this standards requirements package.

3. The LDIs are given in alphabetical order.

agency_incident_response_procedures
This data item coordinates standard response procedures between public safety agencies (e.g. police, fire and rescue, EMS, and towing) and other allied agencies that participate in an incident response.

call_back_information
This data item allows travelers involved in an incident to reestablish and continue communications with an emergency management system after initial contact has been made and ended. This could be something similar to the driver's mobile phone number.

caller_information
This data item contains information about the caller including a call-back number and the caller location (as a street address, latitude/ longitude, or other reference) when available.

commercial_hazmat_route_information
This data item contains information about the route about to be used or planned for a commercial vehicle that will carry hazardous materials. This information may cause the Emergency Services to raise an incident for all or part of the vehicle's route.

commercial_hazmat_vehicle_information
This data item contains information about hazardous materials that are on-board the vehicle and details of the vehicle itself..

commercial_route_number
This data item identifies a commercial vehicle route. It can be used to associate other items of data such as taxes and duties, route details, classes, etc.

current_weather_from_weather_service
This data item contains details of the current weather conditions, e.g. temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.

date
This data item specifies a calendar date that is normally used to indicate currency or effectivity of other data.

driver_information
This data item is used to convey information about the driver. The emergency service providers can dispatch emergency vehicles that will be prepared to give the kind of attention required in each particular situation. Information such as the driver's name, license number, or information about the driver's personal medical history may be included in this data item. Use of this field is voluntary and it should not be coded without the explicit consent of the driver.

emergency_center_identity
This data item identifies the emergency center that is either sending or receiving data about incidents.

emergency_information_request
This data item contains a request for data on emergencies to be sent to the Media. The request must specify the type and severity of emergency desired to be reported on, and the geographic area(s) to which it should relate.

emergency_traffic_control_request_list
This data item contains a list of the route segments that have been provided for use by an emergency vehicle, together with the arrival time at each segment. The data will be used to generate changes to the current traffic management strategy to give the emergency vehicle priority.

from_ep_planned_event_data

This data item carries data about planned events in order to coordinate with the emergency service providers and process information about planned activities in preparation for an incident.

from_other_ec_mayday_emergency_data

This data item contains information about an emergency that was reported by a Mayday system, verified by the Mayday service provider, and determined to require a response from a public safety agency or another authorized responder.

hand_off_coordination

This data item coordinates a positive hand off of responsibility for all or part of an incident response between agencies. It identifies both agencies, the incident, the portion of the response to be handed off, and other information. Many types of transactions will support the negotiation and transfer of responsibility indicated by this data item. The requirement is that the transaction be positive and unambiguous so that both parties can positively determine that a transfer of responsibility has occurred.

hazmat_load_data

This data item contains the manifest data plus the chemical characteristics of a HAZMAT load being carried by a commercial vehicle. This data is used by the emergency services to plan their responses if the vehicle on which the load is traveling is involved in an incident.

hazmat_request

This data item contains a request for information about hazardous materials that are being or about to be carried by commercial vehicles.

hazmat_vehicle_data

This data item contains details such as make, type, towing points, etc. of a vehicle that is carrying a hazardous load. This is used by the emergency services to plan their responses if the vehicle is involved in an incident.

incident_acknowledge

This data item acknowledges the receipt of incident information, requests additional information, and provides general information on response status.

incident_description

This data item contains the description and other free form information associated with an incident.

incident_details_request

This data item is used to request details of incidents from Emergency Services

incident_duration

This data item contains the expected duration of an incident from its start time until the time at which it is expected that it will have no further effect on traffic conditions.

incident_earliest_reporting_time

This data item is part of incident information request, the earliest time for which incident reports are requested.

incident_location

This data item contains the location at which an incident will take place (for planned events) or is taking place (for current incidents).

incident_number

This data item identifies a specific incident.

incident_resource_coordination

This data item coordinates the request and deployment of resources from multiple agencies to the incident scene.

incident_response_clear

This data item is an indication that the incident has been cleared from the roadway.

incident_response_status

This data item provides the current status of an incident response indicating site management strategies in effect, incident clearance status, the incident command structure that is in place, and

points of contact.

incident_severity

This data item identifies the severity of an incident.

incident_start_time

This data item contains the incident start time.

incident_traffic_impact

This data item contains details of the impact that a particular incident will have on traffic flows.

incident_type

This data item uniquely defines the type of incident.

incident_vehicles_involved

This data item defines the number of vehicles involved in an incident at the time of the report.

incident_video_image

This data item contains a high resolution digitized image of a potential or current incident at a particular point on the road or freeway network.

indicator_identity_list

This data item contains a list of indicators to which a particular traffic control strategy is to be applied. The indicators may be intersection traffic signal controllers, pedestrian signal controllers and/or dynamic message signs (dms), the latter being used for lane control or advisory message output purposes.

link_environment_conditions

This data item contains environment conditions (e.g. rain, wind, sun, etc.) computed for a single link.

link_list

This data item contains a list of links for which data is being provided.

link_list_identities

This data item contains a list of links for which data is being provided. These links will comprise all of those on both the road (surface street) and highway network served by the function. It contains the unique identity of each link, which is a short segment typically less than one mile, e.g. a segment of freeway between off-ramps or a street segment between two intersections.

link_state_data

This data item contains data about traffic conditions on each link within the road (surface street) and highway network in the geographic area served by the TMC.

location_identity

This data item contains the location of any transportation feature, entity, or event in an unambiguous and mutually understandable way.

mayday_agency_ID

This data item is used to identify the Mayday service provider that received and processed a Mayday message. This data will accompany the emergency request details sent from the Process Mayday Messages function.

predicted_weather_from_weather_service

This data item contains details of the predicted weather conditions, e.g. temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.

processed_cargo_data

This data item contains data obtained from the processing by sensors of analog data received on-board the vehicle about the composition and state of its cargo.

ramp_identity_list

This data item contains a list of the ramps (ramp metering equipment) to which a particular traffic control strategy is to be applied.

remote_video_image_control

This data item provides the necessary commands to remotely control closed circuit television cameras or other surveillance technologies that allow remote monitoring of roadway incidents.

resource_deployment_status

This data item is sent to the Manage Traffic function indicating the availability of the requested traffic management resources and provides current status of their deployment.

roadway_environment_conditions

This data item contains processed environment sensor information which provides a summary of environment conditions referenced to a link.

route_cost

This data item contains the cost of using a particular route. This is made up of some or all of such things as tolls, fares, port charges, plus the cost of commercial vehicle credential filing and tax payments.

route_list

This data item contains a list of the number of route segments in each route that is being provided to a traveler.

route_segment_description

This data item contains a description of the physical details for the entire route segment. This data is used to provide information from which guidance can be produced in a form which is understandable by the driver, e.g. lane selection, right/left turns, etc.

route_segment_end_point

This data item contains the location of the end of a route segment.

route_segment_estimated_arrival_time

This data item contains the estimated time at which the route segment end point will be reached.

route_segment_estimated_condition

This data item contains the traffic conditions expected on the route segment at the time at which it will be used.

route_segment_estimated_travel_time

This data item contains the estimated time it will take a vehicle to travel the route segment taking account of the expected conditions defined in other data.

route_segment_identity

This data item identifies a route segment by name, location, or other standard location reference.

route_segment_mode

This data item contains the mode that has been selected for use within the route segment. The choice of mode is made as part of the trip planning process. Only one mode can be used in any single route segment.

route_segment_predicted_weather

This data item contains the weather conditions expected on the road segment at the time at which it will be used.

route_segment_start_point

This data item contains the location of the start of a route segment.

route_start_time_date

This data item contains the date and time at which a route will start taken from the time specified in the request for the route.

route_statistics

This data item contains the overall predicted statistics associated with a route which may assist the traveler in making a final route selection. The statistics will include such things as itinerary, estimated net travel time, time of arrival, total distance, anticipated delays/congestion, etc.

selected_emergency_strategy

This data item specifies the type of traffic control strategy to be applied to some or all of the road (surface streets) and highway traffic control units controlled by a TMC. It will give priority to the emergency vehicle(s) by ensuring that they are given the proceed indication (green signal) as they approach each individual intersection, pedestrian and ramp meter control unit along the emergency vehicle route. Another feature of the strategy may be the direction of other vehicles to use particular lanes on a surface street or highway so that the emergency vehicle(s) have a lane for the sole use.

selected_emergency_vehicle_strategy
This data item contains the strategy which has been selected to enable priority to be given to emergency vehicles through the road (surface street) and highway network controlled by the TMC.

staging_area
This data item identifies and locates staging areas in order to coordinate responses to major incidents.

time
This data item contains the current time of day and will be associated with other data items and (possibly) a date.

to_ep_planned_event_confirmation
This data item is the confirmation that the previously submitted event data has been accepted.

to_other_ec_mayday_emergency_data
This data item contains information about an emergency that was reported by a Mayday system, verified by the Mayday service provider, and determined to require a response from a public safety agency or another authorized responder.

traffic_resource_request
This data item is used to request resources to include temporary signs, cones, and other assets that can be used to divert traffic, create detours, and otherwise manage traffic at the incident scene. It also includes requests for any other assets that may be needed to support incident clearance.

transit_coordination_information
This data item contains incident response coordination information for use by processes in that function.

transit_emergency_data
This data item contains details of an emergency on-board a transit vehicle.

transit_fleet_operation_request
This data item contains a request for the transit system operator to take specified actions in response to an incident.

transit_incident_details
This data item contains details of an incident in the transit operations network.

transit_response_to_incident
This data item contains details of what transit action is required in response to an incident. It is used by processes within that function.

vehicle_count
This data item contains a count of the number of vehicles which have been detected at a point location over unit time.

vehicle_crash_sensor_data
This data item contains data obtained from the processing by sensors of analog data received on-board the vehicle. This data provides information about the effects of a crash in which the vehicle has been involved.

vehicle_headway
This data item contains the measure of time between two successive vehicles in a traffic lane as they pass a point on the roadway. Measurements are taken from front bumper of vehicle to front bumper of other vehicle in seconds.

vehicle_identity
This data item contains the identity of a vehicle.

vehicle_license
This data item contains the vehicle license number read from a vehicle that is violating the pollution standards.

vehicle_occupancy
This data item contains a count of the time for which a vehicle occupied the point in the surface street or highway at which a detector is located.

vehicle_queue_length

This data item contains a measure of the length of queue as measured by a traffic sensor.

vehicle_security_status

This data item contains the status of the vehicle's security systems, which include the lock system and/or alarm system. This data item could be a coded representation of the status(e.g.. LE- locks engaged, LD-locks disengaged).

vehicle_speed

This data item contains the speed of a vehicle which has been detected by a detector located on the highway, as the vehicle flowed over its sensor.

vehicle_system_status

This data item contains the operational status of various systems within the vehicle, such as braking, engine, and safety devices. This could be a coded representation of the system status. It may but not be limited to describing information such as engine not at operating temperature, driver in control of the vehicle, vehicle under automatic control, vehicle in acceleration mode, speed increasing, vehicle in deceleration mode, speed decreasing, vehicle in braking mode, brakes on, potential vehicle fault, vehicle safety fault, or a set of parameters with values associated.

wrong_way_vehicle_detection

This data item contains data about wrong-way vehicles detected in reversible lanes.